

Energy Prices-Inflation Nexus: A Historical Analysis for the Case of Ottoman Empire

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Abstract

In this paper, the link between energy prices and price level is investigated from a historical perspective for the case of Ottoman Empire during the period 1885-1914. Although the unit root test results revealed that none of the variables are integrated of second or higher order, the findings of the unit root tests were conflicting. Therefore, to investigate the dynamic relations between energy prices and inflation, ARDL approach to cointegration is employed. The results of the bounds tests showed that energy prices and CPI were cointegrated. Furthermore, ARDL long-run results showed that a 1% change in inflation causes a 0.85% change in energy prices in same direction.

Keywords: Economic history; Ottoman empire; Inflation; Energy prices; ARDL.



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1. Introduction

Inflation is amongst one of the main economic indicators that can be affected by the energy price shocks, since energy price changes may further lead to fluctuations in the price level through both direct and indirect channels. Considering energy is used as a final good by the consumers, the alterations in the prices of energy may affect the consumer price level directly, depending on the share of energy in CPI basket. Furthermore, being an essential input for the production process, energy price changes may also cause surges in the producer prices which may trigger cost-push inflation causing an increase in the price of other goods and services.

On the other hand, shifts in the price level may be followed by an adjustment process in the energy prices due to the rearrangement of inflation expectations. Furthermore, changes in the inflation rate caused by the fluctuations in the energy prices may also affect other economic variables like economic growth, unemployment, exchange rate which are amongst the most important macroeconomic issues for both the policy makers and researchers.

Although it has been of great interest to economist since the oil price shock of the 1970s, the relationship between energy prices and inflation also has historical roots. Therefore, even though investigating the linkage between energy prices and price level by using the contemporary data would contribute to the existing knowledge about the underlying factors of inflation, examining the dynamic relations between energy prices and price level in a historical manner may provide a different perspective for a better understanding of the sources of inflation.

Throughout human history, inflation has been a great phenomenon for both the rulers of the state and policy makers, which needs to be addressed and dealt with, due to the fact that increases in the price of goods and services reduce the purchasing power of households, causing misery and instigating disfavor against the state amongst the general public. In this regard, Ottoman Empire was not an exception.

According to the data provided by Pamuk (2000), the consumer prices increased by 5,536 times during the period of 1469-1918. The highest increase occurred, not surprisingly, during the period of World War I (1914-1918) where the prices increased by 18 times only in four years. Excluding this outlier period, the annual average inflation rate for the Ottoman Empire was 1.3% which implies a total of 307 times increase in the consumer price level during the period of 1469-1914. Pamuk (2000), suggested that, from the late sixteenth to the middle of seventeen century Ottoman Empire has experienced a high level of inflation associating it with the Price Revolution of the sixteenth century. During the 1650-1780 period prices were relatively stable. However, in the 1780-1861 period in which debasements began and accelerated during the reign of Mahmud II, Ottoman Empire faced with hyperinflation where prices increased by almost eighteen times. From 1861 to 1914 consumer prices were comparatively steady. Based upon this historical data and facts (Pamuk, 2000), argued that high inflation rates in the Ottoman Empire was mainly caused by the debasements of the specie content of coinage suggesting evidence that inflation rate was significantly higher during the periods of extensive use of reduction of the coinage, while prices were comparatively stable when the alloy of the coinage remained unaltered.

Although, suggesting that the main source of inflation for the case of Ottoman Empire was the debasement activities of the monetary authorities is highly reasonable and consistent with the economic theory, contribution of other possible sources of inflation, for example energy prices, still needs to be investigated. In this manner, this study contributes to the existing literature being the first attempt, to the best of our knowledge, to uncover the dynamic relations between energy prices and inflation for the Ottoman Empire by using modern econometric techniques.

The remainder of this study is organized as follows. Section 2, provides a brief review of the current literature on energy prices and inflation. Section 3 introduces the data, models and the methodology followed by the Section 4 which presents empirical results. Finally, Section 5 concludes.

2. Literature Review

Fried and Schultze (1975), in their influencing paper suggests that increases in energy prices lead a decrease in aggregate production level causing higher inflation rates in the global scale. Lienert (1981), in his study for Denmark, Finland, Norway and Sweden also proposes that energy prices have significant effect on consumer prices. Bruno and Sachs (1982), suggest that input price shocks including the energy prices had played a very important role in the slowdown of UK's economic growth which triggered cost-push inflation. Darby (1982), contradicting the previous studies argues that the relationship between energy prices and price level is not clear, concluding that the raises in price level which was linked to the alterations in energy prices actually may have been caused by the removal of the price controls which occurred within the same period. Later, Hamilton (1983), provides evidence for the strong relation between oil price shocks and US recessions. Burbidge and Harrison (1984), establish a substantial role for the energy prices in the CPI changes in US and Canada while they find oil price fluctuations are still have significant but smaller impact on the CPI for Japan, Germany and UK.

Gisser and Goodwin (1986), in their work for US economy, used three different methodologies to investigate the macroeconomic effects of the oil price shocks. The findings of the first methodology which is St. Louis-type equations approach suggest that oil prices have strong inflationary effects. According to the multivariate Granger-causality test results, they found that there are no structural changes in the relation between energy prices and macroeconomic variables after the oil price shocks of the 1970s. Gisser and Goodwin (1986), conclude their study by suggesting that inflation rate is very informative about predicting the future oil prices before 1973, based upon the Gweke-Sims type causality test results. Mork (1989), extending Hamilton (1983), study, argues that there is a strong link between oil prices and economic growth for US. Mork (1989), also finds evidence of oil prices increase have strong negative effects on macroeconomic variables while the effects of oil price decreases are not significant.

Following these pioneering works many studies have been devoted to shed more light on the link between energy prices and price level. Kahn and Hampton (1990), in their work for US, show that higher oil prices accelerate inflation in the short run, while more recent oil price shocks have relatively small impact. Mork *et al.* (1994), find that the relationship between oil prices and the CPI is asymmetric. Mork *et al.* (1994), also point out that the asymmetry is very clear for US while for Japan, Canada, UK, Germany and France the asymmetric relation is not as strong as US but still significant.

Fuhrer (1995), argues that there exists a strong relation between oil prices and the CPI for US where the author tests the energy price-price level relation by using Phillips Curve approach. Hooker (1996), by using US data proposes that after 1973, oil prices are no longer Granger cause of many US macroeconomic variables by emphasizing the importance of the problems such as sample stability issues and model misspecifications. Hooker (1996), by challenging Hooker (1996), findings, shows that even after 1973, there still exists a positive correlation between oil prices and recessions if one looks for the net increase in oil prices.

Gordon (1997), by using the time-varying NAIRU finds positive correlation between oil prices and inflation for US data. Huntington (1998), empirically proves that there is an asymmetric relation between oil prices and inflation. However, Huntington (1998), also suggests that if 1986 experience is excluded the relation between oil price and the CPI becomes symmetric for the case of US. Brown *et al.* (1999), by using VAR approach and impulse-response functions find a positive relationship between oil prices and price level for the U.S data. Hooker (2002), finds a strong evidence in favor of a structural break in US data for the year 1981 and therefore proposes that oil price changes make a substantial contribution to the inflation before 1981 but the pass-through effect is very limited after 1981.

Barsky and Kilian (2004), provide evidence in favor of unidirectional causality running from macroeconomic variables to oil prices for US. Cunado and De Gracia (2005), show that oil prices have significant effect on price level for selected ASEAN countries, namely Japan, Singapore, South Korea, Malaysia, Thailand and Philippines. Arpa *et al.* (2006), in their work for EU-25 countries and Austria suggest that the crude oil prices are not directly contributing to inflation but the prices of motor fuel and heating oil which produced from crude oil are the main causes of the price level hikes. Ewing and Thompson (2007), using US data find that oil prices lead consumer prices. Cologni and Manera (2008), empirically prove that oil prices affect the inflation rate for G-7 countries with the exception of Japan and UK, concluding, however, that for some countries monetary policy reactions to oil price shocks are the main cause of higher inflation rates. Chen (2009), analyzing oil price inflation relationship for 19 industrialized countries find that the oil price pass-through into inflation has declined over the years, arguing that, active monetary responses and the degree of openness are the factors which explain the reduced pass-through effect.

Tang *et al.* (2010), reports that oil price affects the inflation positively for the Chinese economy. According to Álvarez *et al.* (2011), even though the oil prices are the major source of inflation volatility for both Spain and euro area, the effect of oil price changes on inflation is limited. Gómez-Loscos *et al.* (2012), argue that oil price changes, which steadily lost its importance as an indicative factor for inflation between 1970 and 2000, regained their explanatory power on inflation during 2000s. Valcarcel and Wohar (2013), point out that the volatility in US inflation is not contagiously explained by the oil prices and they also suggest that oil price inflation pass-through may be a demand sided phenomenon rather than being supply sided. Gao *et al.* (2014), except from highly energy-insensitive expenditures, fail to find a significant pass-through between oil prices and disaggregated CPI's.

Katircioglu *et al.* (2015), propose that there exists a statistically significant negative relation between oil prices and inflation for the OECD countries in general. Zhao *et al.* (2016), evaluate four types of oil price shocks for an open economy by using dynamic stochastic general equilibrium (DSGE) model framework and propose that effects of the oil supply shocks caused by political instability have short term effects, while the remaining three types of shocks produce long-term effects on China's inflation. Salisu *et al.* (2017), reports a positive relationship between oil

price and inflation and the impact of oil prices on inflation is greater for the oil importing countries when compared with the oil exporting countries. Choi *et al.* (2018), using an unbalanced panel of 72 countries, suggests a positive relation between oil prices and inflation. Choi *et al.* (2018), find that a 10% change in oil prices affects the inflation by 0.4% on average in same direction.

In summary, although there exist an extensive and still growing literature concerning the relationship between energy prices and inflation, the results are still inconclusive. To this extend, the main aim of this study is to contribute to the ongoing debate concerning the energy price-inflation relationship by analyzing the case of Ottoman Empire.

3. Data, Model and Methodology

3.1. Data

To investigate the energy price-inflation relationship for the case of Ottoman Empire, annual data was used over the period of 1885-1914 due to data availability. The price level is measured by using the consumer price level in Istanbul, while the price of coal is used as a proxy for energy prices. The base year for the price level was 1469 and the coal prices is measured in shilling. All data were gathered from Pamuk (2000).

3.2. Model

The relationship between energy prices and price level is estimated by using the following models.

$$p_t = f(e_t) \quad (1)$$

$$e_t = f(p_t) \quad (2)$$

where p , denotes price level and e represents energy prices.

In order to calculate the elasticities, logarithmic transformation is applied to equations 1 and 2. The logarithmic forms of the models are

$$lp_t = \alpha_0 + \alpha_1 le_t + \epsilon_{1t} \quad (3)$$

$$le_t = \beta_0 + \beta_1 lp_t + \epsilon_{2t} \quad (4)$$

where l , represents the natural logarithm of the related variable, α_j 's and β_j 's are regression parameters and ϵ_{jt} 's are white noise disturbance terms.

3.3. Methodology

Using time series techniques to investigate the relationships between variables requires to deal with the spurious regression problem which causes biased and inconsistent results. Therefore, to avoid this problem a two-step methodology is used in this paper.

The order of the integration of the variables are examined not only with conventional stationarity tests namely Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) but also by using the Lee and Strazicizh (2003), (LS) unit root test which allows for two structural breaks, in the first step.

Secondly, the appropriate econometric technique to examine the long run relationships between the variables is selected in accordance with the findings of unit root tests. Using conventional cointegration tests like Engel and Granger (1987), Johansen (1988), Johansen and Juselius (1990), and Gregory and Hansen (1996a), Gregory and Hansen (1996a), Gregory and Hansen (1996b), which have a prerequisite for the variables to be stationary at same level may lead biased results in the presence of different level of integration. Moreover, these tests are also not suitable for the small samples as in this study. Therefore, ARDL bounds test approach, introduced and developed by Pesaran P. (1997), Pesaran and Smith (1998), Pesaran and Shin (1999), Pesaran *et al.* (2001), and Pesaran and Pesaran (2010), which allows to examine the cointegration relation between the variables with different order of integration is preferred to investigate the long run relationship between energy prices and price level. Apart from being applicable for the variables which are not integrated of the same order and providing unbiased results for the small sample sizes, having all variables as endogenous and producing results both for the short and long run simultaneously is amongst the other advantages of ARDL approach.

The implementation of the bounds test requires the establishment of the Unrestricted Error Correction Models (UECM). The UECM forms of the equations 3 and 4, including the dummy variables for the structural break years which procured from LS unit root test results, both with and without trend are:

$$\Delta lp_t = \gamma_0 + \sum_{i=1}^{p_1} \gamma_{1i} \Delta lp_{t-i} + \sum_{i=0}^{q_1} \gamma_{2i} \Delta le_{t-i} + \gamma_3 d_1 + \gamma_4 d_2 + \theta_{01} lp_{t-1} + \theta_{11} le_{t-1} + \epsilon_{3t} \quad (5)$$

$$\Delta lp_t = \vartheta_0 + \sum_{i=1}^{p_2} \vartheta_{1i} \Delta lp_{t-i} + \sum_{i=0}^{q_2} \vartheta_{2i} \Delta le_{t-i} + \vartheta_3 d_1 + \vartheta_4 d_2 + \vartheta_5 T + \theta_{02} lp_{t-1} + \theta_{12} le_{t-1} + \epsilon_{4t} \quad (6)$$

$$\Delta le_t = \sigma_0 + \sum_{i=1}^{p_3} \sigma_{1i} \Delta le_{t-i} + \sum_{i=0}^{q_3} \sigma_{2i} \Delta lp_{t-i} + \sigma_3 d_1 + \sigma_4 d_2 + \theta_{03} le_{t-1} + \theta_{13} lp_{t-1} + \epsilon_{5t} \quad (7)$$

$$\Delta le_t = \omega_0 + \sum_{i=1}^{p_4} \omega_{1i} \Delta le_{t-i} + \sum_{i=0}^{q_4} \omega_{2i} \Delta lp_{t-i} + \omega_3 d_1 + \omega_4 d_2 + \omega_5 T + \theta_{04} le_{t-1} + \theta_{14} lp_{t-1} + \epsilon_{6t} \quad (8)$$

where Δ is the first lag operator, p_j 's and q_j 's represent appropriate lag lengths, d_j 's denote the dummy variables for the structural break years and T is the trend variable.

As suggested by Pesaran *et al.* (2001), when implementing the ARDL approach, null hypothesis which states the coefficients of the lagged level variables (θ_{0j} 's and θ_{1j} 's in each equation) are not jointly significant, $H_0: \theta_{0j} = \theta_{1j} = 0$, should be tested against the alternative hypothesis which states the coefficients of the lagged level variables are jointly significant and therefore cointegrated, $H_1: \theta_{0j} \neq \theta_{1j} \neq 0$, by employing the bounds test for the equations 5,6,7 and 8 respectively. In the bounds test approach, the calculated F -statistics and t -statistics should be compared with the lower and upper critical values provided by Pesaran *et al.* (2001). If the calculated F -statistics and t -statistics are lower than the critical values, one concludes that the variables are not cointegrated. However, if the

calculated F -statistics and t -statistics exceeds the upper bound values the variables are said to be cointegrated. On the other hand, if F -statistics and t -statistics falls within the critical values, the result is inconclusive.

If the variables are found to be cointegrated, then the long run estimates of the ARDL model can be extracted from the UECM equations by normalizing θ_{1j} coefficients over θ_{0j} coefficients for each model and the short run parameters can also be obtained from the restricted Error Correction Models. However, the ARDL model still needs to be tested with diagnostics checks for normality, serial correlation heteroscedasticity and functional form. Moreover, to avoid the problem of the instability of the parameters, cumulative sum of recursive residuals (CUSUM) test and the cumulative sum squares of recursive residuals (CUSUMSQ) test should be performed.

4. Empirical Findings

4.1. Unit Root Tests

The results of the stationarity tests with no structural breaks and with structural breaks are presented in Table 1 and Table 2 respectively. ADF and PP test results revealed that price level and energy prices are first difference stationary I(1) variables whether the trend variable is included or not. However, both price level and energy price variables are found to be level stationary I(0) according to the KPSS stationarity test results regardless of including the trend variable.

Table-1. Results of the Unit Root Tests with No Structural Breaks

<i>Test Type</i>	<i>ADF^a</i>				<i>PP^b</i>				<i>KPSS^b</i>			
<i>Variable</i>	<i>C</i>		<i>C+T</i>		<i>C</i>		<i>C+T</i>		<i>C</i>		<i>C+T</i>	
lp	-2.37 (5)		-0.60 (0)		-0.88 (3)		-0.98 (3)		0.21** (4)		0.15* (4)	
le	-2.88 (1)		-3.45 (1)		-2.31 (2)		-2.82 (3)		0.45** (2)		0.14* (0)	
Δ lp	-3.27** (1)		-4.64* (0)		-4.41* (2)		-4.66* (2)		-		-	
Δ le	-4.86* (0)		-3.74** (3)		-4.98* (6)		-4.65* (6)		-		-	
Critical Values	%1	%5	%1	%5	%1	%5	%1	%5	%1	%5	%1	%5
	-3.69	-2.97	-4.57	-3.69	-3.67	-2.96	-4.30	-3.57	0.73	0.46	0.21	0.14

^a Maximum lag length was chosen as 7 and the optimal lag lengths which are shown in the parenthesis are determined by using AIC.

^b Bartlett kernel were used as spectral estimation method and the bandwidth was selected by using the Newey-West method both for the PP and KPSS tests.

C denotes intercept and C+T denotes intercept and trend.

* and ** denotes stationarity at 1% and 5% level respectively.

Moreover, LS unit root test results also suggested that energy price and price level are stationary at their levels I(0), if the Crash model is used for the investigation of the unit root. Contrary to this finding, the results of the break model of the LS unit root test provided evidence for the price level being a level stationary I(0) variable, while the energy price is found to be I(1).

Table-2. Results of the Unit Root Tests with Structural Breaks

<i>Test Type</i>	<i>LS with Two Breaks^a</i>			
<i>Variable</i>	<i>Crash</i>		<i>Break</i>	
lp	-4.96* [1900,1910]		-8.03* [1899,1911]	
le	-4.75* [1895,1911]		-4.84 [1895,1904]	
Δ lp	-		-	
Δ le	-		-6.57** [1898,1909]	
Critical Values	%1	%5	%1	%5
	-4.07	-3.56	-6.69	-6.15

^a Maximum lag length was chosen as 8.

* and ** denotes stationarity at 1% and 5% level respectively.

The years in brackets are structural break years.

4.2. ARDL Bounds Test Results

The dynamic relations between the energy prices and price level is examined by using the ARDL models both with and without trend variable. The findings of the ARDL bounds test results are presented in Table 3.

Table-3. Bounds Test Results

	<i>without trend</i>				<i>with trend</i>			
<i>Model^a</i>	ARDL (1,0)		ARDL (2,4)		ARDL (1,0)		ARDL (1,3)	
<i>F-statistics</i>	F(le lp)=5.56		F(lp le)=0.85		F(le lp)=7.67**		F(lp le)=0.45	
<i>F Values</i>	1%		5%		1%		5%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	6.84	7.84	4.94	5.73	6.56	7.30	8.74	9.63
<i>t-statistics</i>	t(le lp)=-3.17		t(lp le)=-1.09		t(le lp)=-3.78		t(lp le)=-0.10	
<i>t Values</i>	1%		5%		1%		5%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)		
	-3.43	-3.82	-2.86	-3.22	-3.96	-4.26	-3.41	-3.69

^a Appropriate lag length is chosen by using SIC.

* and ** are the 1% and 5% of the significant level respectively.

As seen from Table 3, the null hypothesis which suggests the variables are not cointegrated for the models ARDL (1,0) which does not include trend variable and ARDL (1,3) which includes trend variable for the lp/le relation cannot be rejected, since both F and t statistics of the related models fell below the lower bound critical value. Moreover, the null hypothesis of no cointegration also cannot be rejected for ARDL (2,4) model which does not include trend variable for the relation le/lp , for the same reason. However, since both F and t statistics of the ARDL (1,0) model which includes the trend variable for the relation le/lp exceed the upper bound value the null hypothesis is rejected and therefore the variables are found to be cointegrated.

4.3. Long Run Estimates of the ARDL Model

Having found the cointegration relationship exists between energy prices and price level, the long run estimates obtained from the normalization procedure are provided in Table 4.

Table-4. Long Run Coefficients

Variable	Coefficient	Standard Error	t-statistics	P-value
lnp	0.85	0.39	2.17	0.03**

*, ** are the 1% and 5% of the significant level respectively.

According to the results in Table 4, the coefficient of the price level is found to be positive (0.85) and statistically significant at 5% level, which suggests that a 1% change in the price level would cause a same direction change of %0.85 in energy prices for the case of Ottoman Empire.

4.4. Short Run Estimates and Diagnostic Test Results

The results of both the short run estimates of the restricted ECM model and the diagnostic tests are presented in Table 5.

Table-5. Error Correction Representation

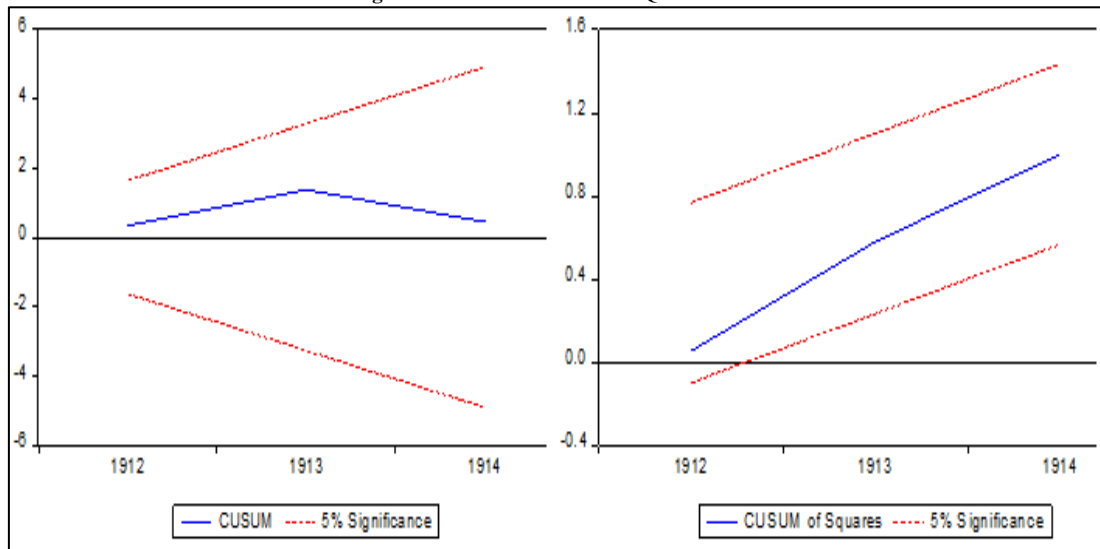
Variable	Coefficient	t-statistics	P-value
intercept	1.04	3.91	0.00*
trend	0.007	1.97	0.06***
d1895	-0.23	-1.49	0.14
d1911	-0.24	-1.81	0.08***
ect(-1)	-0.61	-4.00	0.00*
Important Statistics			
\bar{R}^2	0.34	F-statistics	4.69
RSS	0.54	DW statistics	1.88
Diagnostic Tests			
χ^2_N	4.95 (0.08)	χ^2_{SC}	1.63 (0.80)
χ^2_{HS}	4.75 (0.31)	χ^2_{MM}	1.09 (0.28)

*, ** and *** are the 1%, 5% and 10% of the significant level respectively.

All the coefficients, including the coefficient of the trend variable, in Table 5 are statistically significant at most 10% level, with the exception of the dummy variable for the year 1895. The coefficient of the one period lagged error correction term (-0.61) is negative as expected and also statistically significant at 1% level, which implies 61% of the disequilibrium adjust back to the long run equilibrium in one year.

The robustness of the ARDL (1,0) model is checked with diagnostic tests, namely Jarque-Berra test for normality, Breusch-Godfrey test for serial correlation, ARCH test for heteroskedasticity and Ramsey RESET test for misspecification and the model successfully passed all diagnostic tests. The ARDL (1,0) model is also checked for parameter stability both with CUSUM and CUSUMSQ tests. The results of the CUSUM and CUSUMSQ tests, which provides evidence in favor of parameter stability, are given in Figure.1.

Figure-1.CUSUM and CUSUMSQ Test Results



5. Conclusion

In this study, energy price-inflation nexus was analyzed by using annual data over the period 1885-1914, for the case of Ottoman Empire. ADF, PP, KPSS and LS unit root test were used to determine the stationarity properties of the variables in question. Based upon the unit root test results, bounds test was employed to uncover the inter-relations between energy prices and price level. The findings of the ARDL approach to cointegration revealed that there exist a cointegration relation between energy prices and CPI in which inflation is the long run forcing variable of energy prices. This finding showed that energy price pass-through into inflation hypothesis was not valid for the Ottoman Empire.

The results of the long run estimates showed that 1% increase in price level would lead 0.85% increase in energy prices and according to the findings of error correction model, 61% of the disequilibrium adjust back to the long run equilibrium in one period, for the case of Ottoman Empire.

References

- Álvarez, L. J., Hurtado, S., Sánchez, I. and Thomas, C. (2011). The impact of oil price changes on Spanish and euro area consumer price inflation. *Economic Modelling*, 28(1-2): 422-31.
- Arpa, M., Cuaresma, J. C., Gnan, E. and Silgoner, M. A. (2006). Oil price shock, energy prices and inflation—A comparison of Austria and the EU. *Monetary Policy & the Economy*, 1(Q): 53-77.
- Barsky, R. B. and Kilian, L. (2004). Oil and the macroeconomy since the 1970s. *Journal of Economic Perspectives*, 18(4): 115-34.
- Brown, S., Yucel and Mine (1999). Oil prices and US aggregate economic activity: a question of neutrality. *Economic and Financial Policy Review*, (Q II): 16-23.
- Bruno, M. and Sachs, J. (1982). Input price shocks and the slowdown in economic growth: the case of UK manufacturing. *The Review of Economic Studies*, 49(5): 679-705.
- Burbidge, J. and Harrison, A. (1984). Testing for the effects of oil-price rises using vector autoregressions. *International Economic Review*: 459-84.
- Chen, S. S. (2009). Oil price pass-through into inflation. *Energy Economics*, 31(1): 126-33.
- Choi, S., Furceri, D., Loungani, P. M., S. and Poplawski-Ribeiro, M. (2018). Oil prices and inflation dynamics: Evidence from advanced and developing economies. 82: 71-96.
- Cologni, A. and Manera, M. (2008). Oil prices, inflation and interest rates in a structural cointegrated VAR model for the G-7 countries. *Energy Economics*, 30(3): 856-88.
- Cunado, J. and De Gracia, F. P. (2005). Oil prices, economic activity and inflation: evidence for some Asian countries. *The Quarterly Review of Economics and Finance*, 45(1): 65-83.
- Darby, M. R. (1982). The price of oil and world inflation and recession. *The American Economic Review*, 24(4): 738-51.
- Engel, R. F. and Granger, C. W. J. (1987). Cointegration and error correction: representation, estimation and testing. *Econometrica*, 55: 251-76.
- Ewing, B. T. and Thompson, M. A. (2007). Dynamic cyclical comovements of oil prices with industrial production, consumer prices, unemployment, and stock prices. *Energy Policy*, 35(11): 5535-40.
- Fried, E. R. and Schultze, C. L. (1975). *Overview, higher oil prices and the world economy*. The Brookings Institution: Washington DC. 221-32.
- Fuhrer, J. C. (1995). The Phillips curve is alive and well. *New England Economic Review*: 41-57.
- Gao, L., Kim, H. and Saba, R. (2014). How do oil price shocks affect consumer prices? *Energy Economics*, 45: 313-23.
- Gisser, M. and Goodwin, T. H. (1986). Crude oil and the macroeconomy: Tests of some popular notions: Note. *Journal of Money, Credit and Banking*, 18(1): 95-103.

- Gómez-Loscos, A., Gadea, M. D. and Montañés, A. (2012). Economic growth, inflation and oil shocks: are the 1970s coming back? *Applied Economics*, 44(35): 4575-89.
- Gordon, R. J. (1997). The time-varying NAIRU and its implications for economic policy. *Journal of economic Perspectives*, 11(1): 11-32.
- Gregory and Hansen (1996a). Tests for cointegration in models with regime and trend Shifts. *Oxford Bulletin of Economics and Statistics*, 58(3): 555-60.
- Gregory and Hansen (1996b). Residual-based Tests for cointegration in models with regime shifts. *Journal of Econometrics*, 70: 99-126.
- Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *Journal of Political Economy*, 91(2): 228-48.
- Hooker, M. A. (1996). What happened to the oil price-macroeconomy relationship? *Journal of Monetary Economics*, 38(2): 195-213.
- Hooker, M. A. (2002). Are oil shocks inflationary? Asymmetric and nonlinear specifications versus changes in regime. *Journal of Money, Credit and Banking*: 540-61.
- Huntington, H. G. (1998). Crude oil prices and US economic performance: where does the asymmetry reside? *The Energy Journal*: 107-32.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2-3): 231-54.
- Johansen, S. and Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2): 169-210.
- Kahn, G. A. and Hampton, J. R. (1990). Possible monetary policy responses to the Iraqi oil shock. *Federal Reserve Bank of Kansas City Economic Review*, 2: 19-32.
- Katircioglu, S. T., Sertoglu, K., Candemir, M. and Mercan, M. (2015). Oil price movements and macroeconomic performance: Evidence from twenty-six OECD countries. *Renewable and Sustainable Energy Reviews*, 44: 257-70.
- Lee, J. and Strazlicizh, M. C. (2003). Minimum Lagrange Multiplier unit root test with two structural breaks. *The Review of Economics and Statistics*, 85(4): 1082-89.
- Lienert, I. (1981). The macroeconomic effects of the 1979/80 oil price rise on four Nordic economies. *The Scandinavian Journal of Economics*: 201-19.
- Mork, K. A. (1989). Oil and the macroeconomy when prices go up and down: an extension of Hamilton's results. *Journal of Political Economy*, 97(3): 740-44.
- Mork, K. A., Olsen, Ø. and Mysen, H. T. (1994). Macroeconomic responses to oil price increases and decreases in seven OECD countries. *The Energy Journal*: 19-35.
- Pamuk, Ş. (2000). *500 years of prices and wages in Istanbul and other cities, 1469-1998*. State Institute of Statistics Prime Ministry Republic of Turkey.
- Pesaran and Smith, R. J. (1998). Structural analysis of cointegrating VARs. *Journal of Economic Surveys*, 12: 471-505.
- Pesaran and Shin, Y. (1999). *An autoregressive distributed lag modeling approach to cointegration analysis*, In: Strom, S., Holly, A., Diamond, P. (Eds.), *Centennial Volume of Rangar Frisch*. Cambridge University Press: Cambridge.
- Pesaran and Pesaran (2010). *Time series econometrics using Microfit 5.0: A user's manual*. Oxford University Press, Inc.:
- Pesaran, Shin, Y. and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16: 289-326.
- Pesaran, P. (1997). *Working with Microfit 4.0: An interactive econometric software package (DOS and Windows versions)*. Oxford University Press: Oxford.
- Salisu, A. A., Isah, K. O., Oyewole, O. J. and Akanni, L. O. (2017). Modelling oil price-inflation nexus. *The role of asymmetries*. *Energy*, 125: 97-106.
- Tang, W., Wu, L. and Zhang, Z. (2010). Oil price shocks and their short-and long-term effects on the Chinese economy. *Energy Economics*, 32: S3-S14.
- Valcarcel, V. J. and Wohar, M. E. (2013). Changes in the oil price-inflation pass-through. *Journal of Economics and Business*, 68: 24-42.
- Zhao, L., Zhang, X., Wang, S. and Xu, S. (2016). The effects of oil price shocks on output and inflation in China. *Energy Economics*, 53: 101-10.

